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DDT IN BOTTOM SEDIMENTS AROUND FIVE SOUTHERN CALIFORNIA OUTFALL SYSTEMS

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INTRODUCTION

The pesticide DDT appears to be one of the most serious contaminants yet described in the Southern California Bight. Levels of this chlorinated hydrocarbon and its metabolites in sandcrabs and intertidal mussels taken off Palos Verdes Peninsula in the early 1970's were 50 to 100 times higher than concentrations found 200 km to the north and south (Burnett 1971; Southern California Coastal Water Research Project 1973). In addition, approximately two-thirds of the Dover sole trawled off the Peninsula during 1971-72 were found to contain muscle concentrations exceeding the 5-ppm limit for seafood intended for interstate commerce set by the U.S. Food and Drug Administration (Southern California Coastal Water Research Project 1973). Such DDT gradients are attributed to long-term discharges of this pesticide via the submarine municipal wastewater outfalls of the County Sanitation Districts of Los Angeles County off Whites Point (Figure 1). Approximately 19,000 kg/yr total DDT were discharged through this system in 1971, and although the amount had been reduced to approximately 3,000 kg/yr in 1973, the outfall system is still the dominant known source of DDT to the Bight (Southern California Coastal Water Research Project 1973).

Trace constituents such as heavy metals and chlorinated hydrocarbons are found to be largely associated with particulate matter in wastewaters (Young et al. 1973; Southern California Coastal Water Research Project 1973). Therefore, the sediments in the receiving environment may be an important reservoir of these contaminants. To investigate this possibility, the Coastal Water Research Project conducted a survey of DDT compounds in ocean bottom sediments collected around the major municipal wastewater discharge systems in the Bight: The data obtained from these studies are reported here, and the results are briefly evaluated.

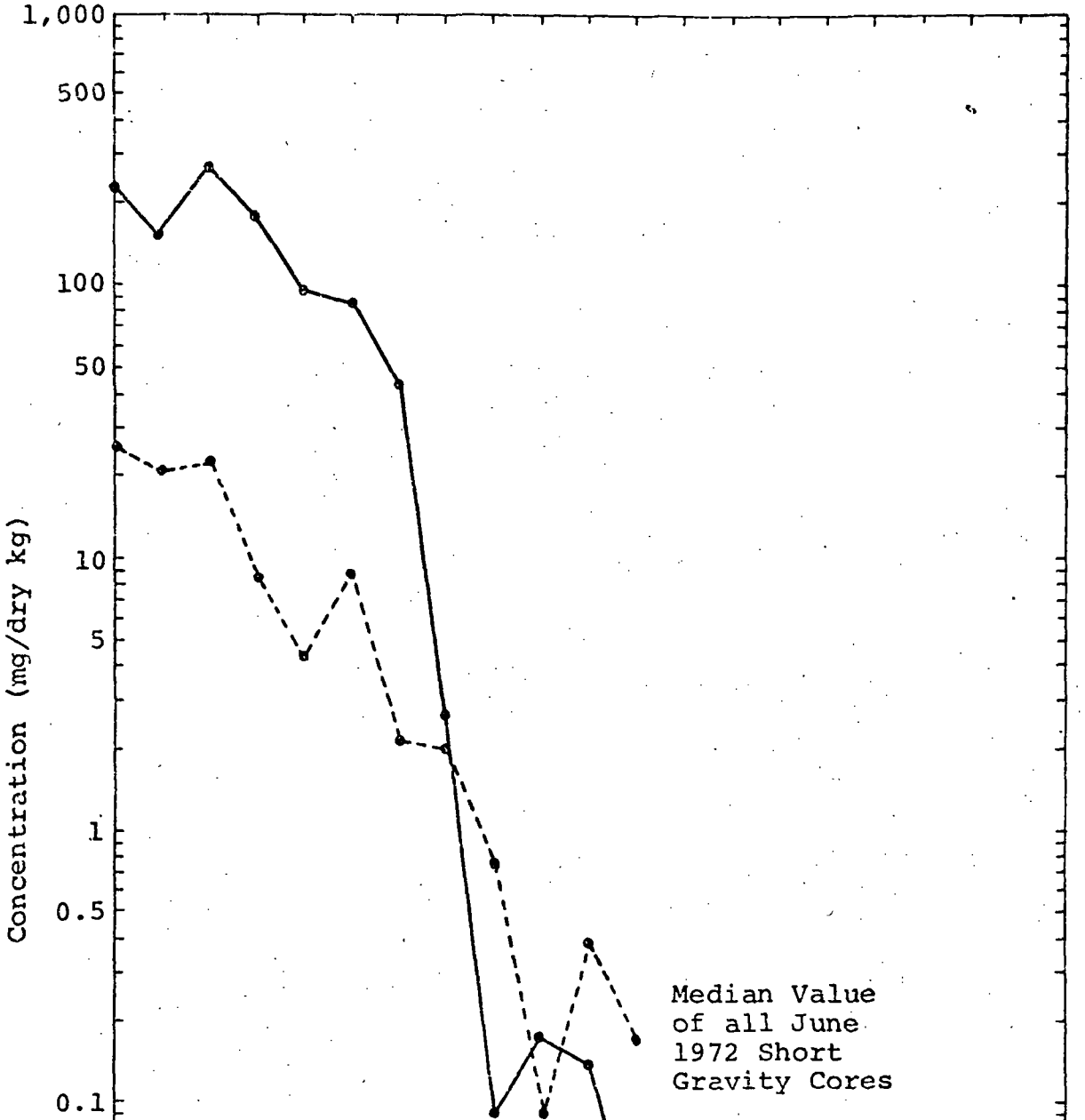

Figure 2. Vertical profile of total DDT in the short gravity core taken at Station 6B, 2 km northwest of the JWPCP 90-in. diffuser, and total DDT median values for all June 1972 short gravity cores, with depth.

CONCLUSIONS

Most of the coring devices presently in use cause some degree of disturbance to the surface material. Short barrel gravity corers, while convenient, appear to cause the most disruption. At this time, the box corer is considered to be the best sampling device. It is hoped that an improved sediment collection method, such as the use of a more convenient box corer, can be uniformly adopted in the outfall monitoring programs throughout the Bight. Such a device is now under development by the Project.

Figure 12 shows a comparison of total DDT in sediments from around the five major outfall systems in southern California. The concentrations shown are the median values of all cores taken around each outfall at the given layers. The dates of sampling and the type of core varied.* However, the comparison does illustrate existing differences in the magnitude of the sediment DDT concentrations at the various submarine discharge sites. The largest values for both concentrations and horizontal and vertical gradients of DDT compounds are observed in the bottom sediments off Palos Verdes. In these sediments, the median concentrations fall by a factor of ten at a depth of 12 cm, and by another order of magnitude at 22 to 24 cm. Similarly, the surface values have a range of two orders of magnitude (2.8 to 230 mg/dry kg). There is a 1,000-fold difference between median DDT concentrations in the Palos Verdes area and those in the Point Loma areas; intermediate values characterize the other discharge sites, although concentrations fall rapidly with distance from the Palos Verdes region.

Analysis of DDT concentrations measured in Palos Verdes sediments indicates that between 180 and 250 metric tons of this pesticide and its residues are contained in the upper 30 cm (12 inches) of a 48 sq km (18.5 sq mi) area around the outfall system. In contrast, the 1973 annual input of DDT to the area from the JWPCP outfalls, a point source, is about 3 metric tons, and the total annual diffuse input from aerial fallout to the southern California coastal waters is about 1 metric ton. Surface runoff inputs appear to be an order of magnitude lower. The principal residue observed was p,p'-DDE, which consitututed 55 to 75 percent of the total DDT measured in

* Oxnard, August-September 1971, box cores; Los Angeles City 7-mile outfall, July 1971, box cores, and 5-mile outfall, Summer 1972, gravity cores; JWPCP, June 1972, gravity cores; Orange County, September 1971, box cores; Point Loma, August 1971, gravity cores.

these sediments. This is also the principal DDT compound found in organisms in the discharge region.

The results indicate that the Palos Verdes sediments constitute by far the largest known local benthic reservoir of these chlorinated hydrocarbons along the southern California coast. Research is continuing in an effort to determine the availability of this material to marine organisms.

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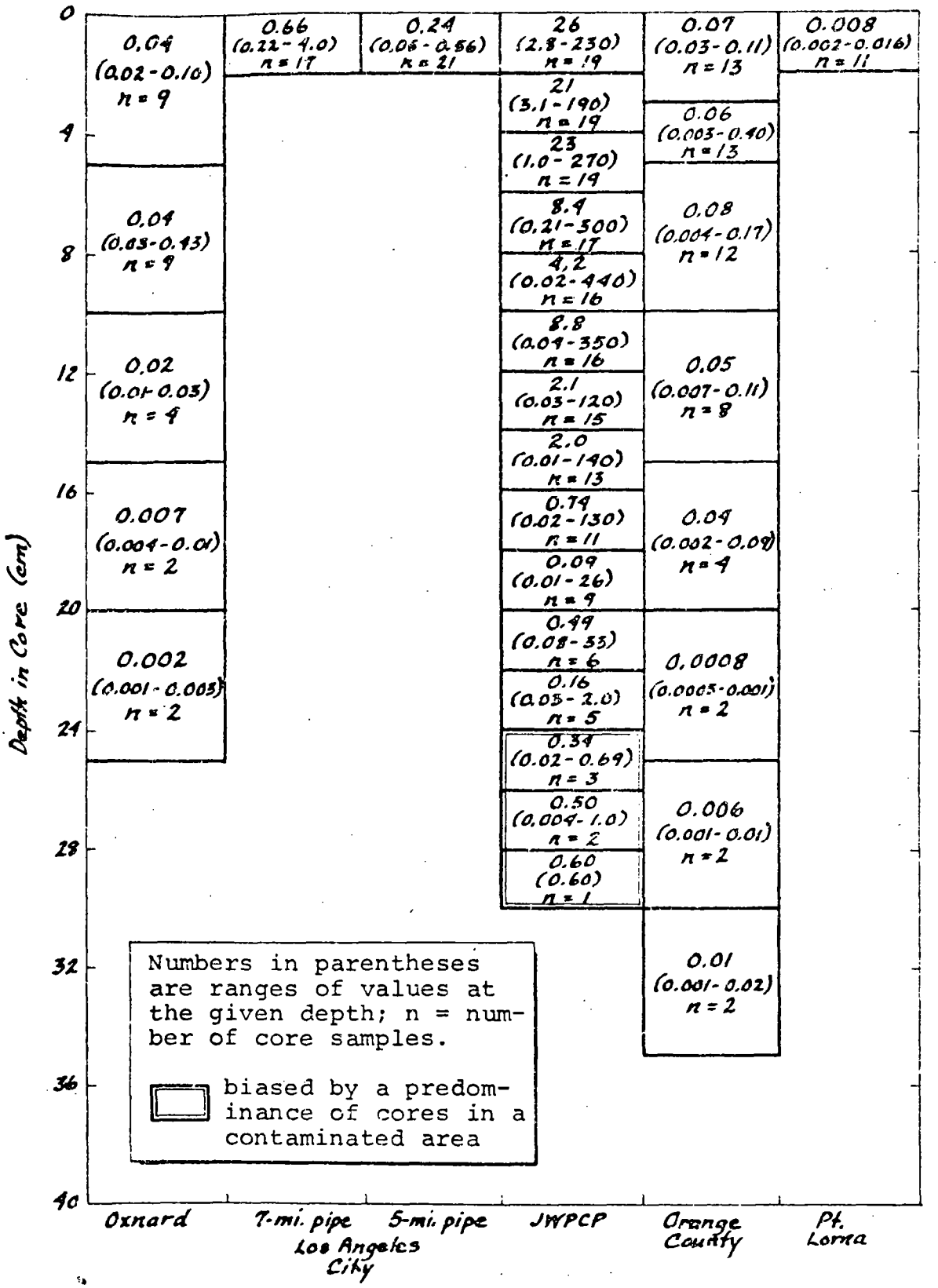

Figure 12. Median concentrations of total DDT (mg/dry kg) in sediments around five major outfall systems.